

WHAT IS CLAIMED IS

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1. A character recognition method for carrying out a character recognition using a cross section sequence graph which describes features of a character image, comprising the steps of:

10 (a) extracting the cross section sequence graph from a character string image;

(b) analyzing a singular region of the cross section sequence graph and generating a virtual boundary point sequence in the singular region based on an  
15 analyzed result;

(c) generating character candidates by combining structural elements of the cross section sequence graph and recognizing one character by supplying the virtual boundary point sequence with respect to the generated  
20 character candidates if necessary; and

(d) recognizing a character string based on an adjacency relationship of the character candidates which are recognized as one character in said step (c).

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2. The character recognition method as  
claimed in claim 1, wherein the singular region in which  
5 the virtual boundary point sequence is generated  
includes a region where character string is closely  
adjacent or in contact.

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3. The character recognition method as  
claimed in claim 1, further comprising the step of:

(e) determining a generating position of the  
15 virtual boundary point sequence based on the singular  
region and a connecting sequence and positions of cross  
section sequences connecting to the singular region.

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4. The character recognition method as  
claimed in claim 1, wherein said step (b) refers to a  
direction of the character string when generating the  
25 virtual boundary point sequence and generating no

virtual boundary point sequence between cross section sequences not corresponding to the direction of the character string.

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5. The character recognition method as claimed in claim 1, wherein said step (b) generates the virtual boundary point sequence using a predetermined curve generating method.

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6. The character recognition method as claimed in claim 1, further comprising the step of:

(e) dividing the structural elements into first and second layers and managing the first and second layers by tags.

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7. The character recognition method as

claimed in claim 6, wherein the first layer of the structural elements include the cross section sequences and the singular region, and said step (e) manages the cross section sequences by a first tag and manages the singular region by a second tag.

10           8. The character recognition method as claimed in claim 7, wherein the second layer of the structural elements include boundary point sequences, and said step (e) manages the boundary point sequences by a third tag.

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          9. The character recognition method as claimed in claim 8, wherein said step (e) manages a blank region between characters of the character string by a fourth tag.

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10. The character recognition method as  
claimed in claim 9, wherein said step (c) generates the  
character candidates by combining the first, second,  
5 third and fourth tags, and said step (e) manages the  
generated character candidates by a fifth tag.

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11. The character recognition method as  
claimed in claim 10, wherein said step (c) eliminates an  
overlap of tags when combining the first, second and  
third tags, by using either one of the tag of the first  
15 layer and the tag of the second layer, with respect to  
identical structural elements.

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12. The character recognition method as  
claimed in claim 10, wherein said step (d) recognizes  
the character string by generating links among fifth  
tags, generating paths among generated links, and  
25 selecting an optimum path of the generated paths.

5                   13. A computer-readable storage medium which  
stores a program for causing a computer to carry out a  
character recognition, said program comprising:

means for causing the computer to extract from a  
character string image, cross section sequences and a  
10 singular region of a first layer of a cross section  
sequence graph, and boundary point sequence of a second  
layer of the cross section sequence graph;

means for causing the computer to generate  
character candidates by combining the cross section  
15 sequences, the singular region and the boundary point  
sequences;

means for causing the computer to recognize one  
character with respect to the generated character  
candidates; and

20 means for causing the computer to recognizing a  
character string based on an adjacency relationship of  
the character candidates which are recognized as one  
character.

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14. The computer-readable storage medium as  
claimed in claim 13, wherein the program further  
5 comprises:

means for causing the computer to analyze the  
singular region and generating a virtual boundary point  
sequence in the singular region based on an analyzed  
result of the singular region; and

10 means for causing the computer to convert the  
character candidates made up of the cross section  
sequences and the singular region into boundary point  
sequences by supplying the virtual boundary point  
sequence if necessary when recognizing one character.

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15. The computer-readable storage medium as  
20 claimed in claim 14, wherein the program further  
comprises:

means for generating a first tag for managing the  
cross section sequences, a second tag for managing the  
singular region, a third tag for managing the boundary  
25 point sequences, and a fourth tag for managing a blank

within the character string.

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16. The computer-readable storage medium as claimed in claim 15, wherein the program further comprises:

means for causing the computer to generating a  
10 fifth tag for managing character candidates which are generated by combining the first, second, third and fourth tags.

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17. The computer-readable storage medium as claimed in claim 16, wherein the program further comprises:

20 means for causing the computer to managing the first, second, third and fifth tags by identical logic structures.

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18. A computer-readable storage medium which stores a program for causing a computer to carry out a character recognition using a cross section sequence graph which describes features of a character image,  
5 said program comprising the steps of:

(a) causing the computer to extract the cross section sequence graph from a character string image;

(b) causing the computer to analyze a singular  
10 region of the cross section sequence graph and generating a virtual boundary point sequence in the singular region based on an analyzed result;

(c) causing the computer to generate character candidates by combining structural elements of the cross  
15 section sequence graph and recognize one character by supplying the virtual boundary point sequence with respect to the generated character candidates if necessary; and

(d) causing the computer to recognize a character  
20 string based on an adjacency relationship of the character candidates which are recognized as one character in said step (c).

19. A character recognition apparatus for carrying out a character recognition using a cross section sequence graph which describes features of a character image, comprising:

an extracting unit extracting the cross section sequence graph from a character string image;

an analyzing unit analyzing a singular region of the cross section sequence graph and generating a virtual boundary point sequence in the singular region based on an analyzed result;

a generating unit generating character candidates by combining structural elements of the cross section sequence graph and recognizing one character by supplying the virtual boundary point sequence with respect to the generated character candidates if necessary; and

a recognizing unit recognizing a character string based on an adjacency relationship of the character candidates which are recognized as one character in said generating unit.